

CLAIMS

- 1 1. An inductive energy harvester that generates electrical energy from mechanical
2 vibrations, the energy harvester comprising:
3 a magnetic field source having a first pole and a second pole that
4 generate a magnetic field;
5 an induction coil;
6 an induction coil support that positions the induction coil near the first
7 magnetic field source pole; and
8 a mechanical connector that mechanically couples the magnetic field
9 source to the induction coil support in a manner that allows relative movement
10 between the magnetic field source and the induction coil in response to the
11 vibrations.
- 1 2. The inductive energy harvester of claim 1 further comprising:
2 a flux concentrator attached to the first pole in order to concentrate the
3 magnetic field emerging from the first pole in the vicinity of the induction coil.
- 1 3. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises a spiral disk spring.
- 1 4. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises a pair of spiral disk springs.
- 1 5. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises at least one leaf spring.
- 1 6. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises at least one coil spring.

- 1 7. The inductive energy harvester of claim 1 further comprising a flux yoke attached
2 to the second magnetic field source pole to provide a low reluctance flux path
3 between the first and second magnetic field source poles.
- 1 8. The inductive energy harvester of claim 7 wherein the flux yoke surrounds the
2 magnetic field source.
- 1 9. The inductive energy harvester of claim 7 wherein the mechanical connector
2 attaches to the flux yoke.
- 1 10. The inductive energy harvester of claim 9 further comprising a non-magnetic
2 housing and wherein the mechanical connector attaches to the housing.
- 1 11. The inductive energy harvester of claim 7 wherein the flux yoke is a magnet
2 having a polarization that enhances magnetic flux in the vicinity of the induction
3 coil.
- 1 12. The inductive energy harvester of claim 11 wherein the flux yoke comprises an
2 annular permanent magnet.
- 1 13. The inductive energy harvester of claim 1 wherein the induction coil surrounds
2 one pole of the magnetic field source.
- 1 14. The inductive energy harvester of claim 1 wherein the magnetic field source is a
2 permanent magnet.

- 1 15. The inductive energy harvester of claim 1 further comprising a second magnetic
2 field source arranged in magnetic flux opposition to the magnetic field source.
- 1 16. The inductive energy harvester of claim 15 further comprising a magnetic flux
2 concentrator positioned between the magnetic field source and the second
3 magnetic field source and in the vicinity of the induction coil.
- 1 17. An inductive energy harvester that generates electrical energy from mechanical
2 vibrations, the energy harvester comprising:
3 a permanent magnet having a first pole and a second pole that generates
4 a magnetic field;
5 a flux concentrator attached to the first pole;
6 an induction coil surrounding the flux concentrator;
7 a spring that mechanically couples the permanent magnet to the induction
8 coil in a manner that allows relative movement between the permanent magnet
9 and the induction coil in response to the vibrations.
- 1 18. The inductive energy harvester of claim 17 wherein the flux concentrator is
2 comprised of a high magnetic permeability material.
- 1 19. The inductive energy harvester of claim 17 further comprising a magnetically
2 permeable flux yoke extending from the second pole to the first pole.
- 1 20. The inductive energy harvester of claim 19 wherein the flux yoke is an annular
2 permanent magnet with a polarization that enhances magnetic flux in the vicinity
3 of the induction coil.
- 1 21. The inductive energy harvester of claim 19 wherein the flux yoke surrounds the
2 permanent magnet.

- 1 22. The inductive energy harvester of claim 19 further comprising a non-magnetic
2 housing and wherein the spring attaches the housing to the flux yoke.
- 1 23. The inductive energy harvester of claim 22 further comprising a second spring
2 attached between the flux yoke and the housing.
- 1 24. The inductive energy harvester of claim 17 wherein the spring is a spiral disk
2 spring.
- 1 25. The inductive energy harvester of claim 17 wherein the spring is a leaf spring.
- 1 26. The inductive energy harvester of claim 17 wherein the spring is a coil spring.
- 1 27. An inductive energy harvester that generates electrical energy from mechanical
2 vibrations, the energy harvester comprising:
3 a first permanent magnet having a first pole and a second pole that
4 generates a magnetic field;
5 a second permanent magnet having a first pole in opposing flux
6 relationship with the first permanent magnet first pole and a second pole;
7 a flux concentrator attached to the first permanent magnet first pole and
8 positioned between the first permanent magnet and the second permanent
9 magnet;
10 an induction coil surrounding the flux concentrator;
11 a spring that mechanically couples the first and second permanent
12 magnets to the induction coil in a manner that allows relative movement between
13 the first and second permanent magnets and the induction coil in response to the
14 external vibrations.

- 1 28. The inductive energy harvester of claim 27 wherein the flux concentrator is
2 comprised of a high magnetic permeability material.
- 1 29. The inductive energy harvester of claim 28 further comprising a flux yoke
2 extending from the first permanent magnet second pole to the second permanent
3 magnet second pole.
- 1 30. The inductive energy harvester of claim 28 wherein the flux yoke surrounds the
2 first and second permanent magnets.
- 1 31. The inductive energy harvester of claim 29 further comprising a non-magnetic
2 housing and wherein the spring attaches the housing to the flux yoke.
- 1 32. The inductive energy harvester of claim 31 further comprising a second spring
2 attached between the flux yoke and the housing.
- 1 33. The inductive energy harvester of claim 27 wherein the spring is a spiral disk
2 spring.
- 1 34. The inductive energy harvester of claim 27 wherein the spring is a leaf spring.
- 1 35. The inductive energy harvester of claim 27 wherein the spring is a coil spring.